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TITLE: Multi-modal traveler information system

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Previous implementations of similar concepts have focused on decomposing the transportation grid into preselected roadway segments that travelers can access via predetermined codes. While this approach may be an improvement over general broadcast methods, it does not address multi-modal travel (e.g. using different forms of transportation), may cause the end user a significant amount of involvement in obtaining the information and does not support the concept of limiting notification to only times when travel conditions affect the user. Further, previous implementations of similar concepts have not been fully generalized to communication systems by which the user may wish to receive information.

Brief Summary Text (10):

Accordingly, it is seen that prior approaches to limitation of travel information provided to a user have been insufficiently specific to the user's needs and insufficiently flexible in regard to communication media which may be employed or the route and possible modes of travel which may be of interest to the user and do not support full flexibility of choice in travel routes, conveyance and other choices which may be made by a traveller in the process of expeditiously reaching a destination.

Brief Summary Text (12):

It is therefore an object of the present invention to provide a system and method for matching travel condition information to a user's needs and preferred communication media and utilization thereof, such as automatic notification or call-in/information on demand.

Drawing Description Text (11):

FIG. 9A and 9B together form a flow chart for determining customers that need to be automatically notified in accordance with the invention,

Drawing Description Text (16):

FIG. 14 is a flow chart illustrating a preferred operation in accordance with the invention for managing automatic subscriber notification,

Drawing Description Text (17):

FIGS. 15A and 15B are flow charts illustrating a preferred operation in accordance with the invention for conducting automatic subscriber notification,

Detailed Description Text (4):

Specifically, as shown in FIG. 1, the multi-modal travel information system 100 in accordance with the invention receives real-time travel condition information from an information infrastructure 20 and preferably includes, for example, information concerning accidents, construction, special events (planned or unplanned) and

weather information. The information, as received, may or may not be correlated with travel modes 30 and some degree of correlation, such as railroad or tramway conditions which are generally unique to those travel modes, or weather conditions which affect all modes of travel except subways, may be inherent in the data.

Detailed Description Text (5):

The Multi-Modal Traveler Information System (MTIS) 100 significantly reduces the traveler's burden and frustration with the additional and often irrelevant information reported by known systems through dissemination of portions of the generalized travel conditions information 20 based upon their personalized multi-modal profile input thereto, as depicted at 40. This personalized multi-modal profile would contain such items as the traveler's name, preferred travel mode(s) (e.g. roadway, bus, subway, rail, ferry, air, tramway, etc.), primary and alternate travel route(s), travel time(s), notification time window(s) during which travel is anticipated, and preferred information delivery device(s) (e.g. telephone (wired & wireless), pager (one-way & two-way), e-mail, facsimile, Internet, Intranet, in-vehicle device, etc.), collectively depicted at 60. It is with this personal information 40 that the system 100 is able to construct a filter that provides the end user with personalized travel conditions information.

Detailed Description Text (6):

Dissemination of personalized information is provided by means of any end user device that is compatible with transmission of real-time voice, video or digital message information (e.g. telephone (wired & wireless), pager (one-way & two-way), e-mail, facsimile, Internet, Intranet, in-vehicle device, etc.). For devices that support two way communications, such as the telephone, Internet and two way pagers, end users may request personalized information at any time. For all devices, the end user may have the system notify them automatically according to a set of notification criteria such as time of day, information thresholds (e.g. depth of snow, total length of anticipated delays, total travel time, required arrival time, etc.), and the like.

Detailed Description Text (8):

The preferred implementation of this invention for dissemination of personalized travel conditions information (accidents, congestion, delays, travel times, construction, weather, special events and road surface conditions) to travelers uses any combination of travel modes (e.g. roadway, bus, subway, rail, ferry, air, tramway, and the like). Travel conditions information specific to a traveler's multi-modal travel routes would be immediately available to those who have registered their multi-modal travel routes and notification criteria 40 with a service provider. Preferably, information content, communications protocols, and information geographic referencing would all be in accordance with existing industry standards and evolving Intelligent Transportation Systems (ITS) open systems standards. Source providers of general travel conditions information 20 would include traffic operations centers, traveler information centers, or any other information service provider (e.g. news wire service) who provides the real-time travel conditions information in industry and open systems standard formats. Again, the invention does not rely on any particular communication protocols or non-public geographic referencing methods.

Detailed Description Text (9):

As will be discussed in greater detail below, new customers register with a service provider (via communication with a customer service representative or the personal Internet interface, generally indicated at 40 of FIG. 1). Data elements are collected/captured for their personal profile for uniquely identifying the traveler, their personal travel route(s) and their preferred notification criteria and communication device(s) for information delivery. Each route defined within the profile contains a description, origin, multi-modal path and destination. Customers may register particular route(s) for automatic notification. The notification criteria includes the preferred delivery device (e.g., telephone, fax, pager, e-

mail, etc.) and the day(s) of week and time(s) of day that travel on the route is anticipated.

Detailed Description Text (10):

Generalized travel conditions information is filtered by filters which are built by the system 100 according to the information provided in the pre-stored customer profiles. The filtering process occurs in multiple stages. In the first stage of the filtering process, as will be discussed in detail below, the location of the travel condition is compared with the routes in the customer profiles to determine which customers may be affected. For those customers that are affected and have registered for automatic notification, the filtration process continues with a comparison of the customer's notification time window and the expected duration of the travel condition. Once the determination has been made that the customer's designated notification time window falls some time during the expected duration of the event, a determination is then made as to when to notify this customer about the travel condition. The final stage of the filtering process is to determine the customer's notification preference (e.g. telephone (wired & wireless), pager (one-way & two-way), e-mail, facsimile, Internet, Intranet, in-vehicle device, etc.).

Detailed Description Text (11):

The invention provides two modes of operation: user on demand request and automatic notification. The user on demand request operation is driven by the end user call-in requesting current travel conditions applicable to one of their pre-stored routes. Upon receiving the customer's choice of pre-stored route(s), the system will determine if there are any current reportable travel conditions that impact the selected route. Any reportable travel conditions which impact the selected route are then reported to the customer. Automatic notification is driven by the occurrence of a travel condition. A travel condition enters the system which triggers the event/profile filtering process as described above, and results in a customer being notified by means of their preferred notification device.

Detailed Description Text (33):

The function of registering a new customer which develops the data object structure depicted in FIG. 5 provides the means for entering the customer's account information, their personal travel route(s) and preferred notification criteria. The data provided by the customer will be stored in their own customer account in the relational database management system (RDBMS) for MTIS 100. FIG. 5 represents the structure of the data that is stored in the relational database included by the customer service center 202 of FIG. 2.

Detailed Description Text (41):

As further depicted in FIG. 5, the customer determines the type of service to be provided, either user-on-demand request or automatic notification for each of the defined routes 503. Other route specific information that is collected is the notification device information and the notification time window defined in an object of the customer route detail class 505.

Detailed Description Text (43):

First, MTIS determines if a travel conditions report is for a new travel conditions event, an update to an existing event or a closure to a previously reported event at 701. If the event is closed, meaning the travel condition no longer exists, then the MTIS deletes customer data associated with that event from the affected customers database as illustrated at 703. When there is a new travel conditions event or update to an existing event, customers are identified as being affected by the reported travel conditions based on their specific areas, route segment sequence numbers which defines travel mode, and/or points of interest as indicated at 702 and a list of customers to be notified is built at 704. The determination is then made as to which customers will need to be automatically notified as indicated at 706. More specifically, the function of determining affected customers is preferably partitioned into three sub-functions: Build Affected Customer List

(Route Specific) 705, Determine Customers to Auto-Notify 706, and Build Affected Customer List (Area Specific) 704.

Detailed Description Text (45):

It should be appreciated that the collective function of 809 and 810 is to determine customers which are affected by any event, whether planned or unplanned, in order to enable notification which may be ultimately carried out on either a call-in or automatic notification basis or both. For a number of reasons, including economy, advance knowledge and notification of planned events and the likelihood of a customer obtaining knowledge of planned events independently of the system of the invention and other expedients discussed below, it is preferred to avoid automatic notification of planned events and only include such information with information about unplanned events that invoke automatic notification. Thus, as a matter of processing economy and system performance, it is preferred to separate planned and unplanned events prior to building respective affected customer lists for planned and unplanned events. As a design alternative within the scope of the invention, it may be preferable to determine if a customer is affected by a planned event at the time a customer calls in in order to limit storage of large customer lists. Otherwise, processing for determination of customers affected by a planned event can be carried out at any convenient time.

Detailed Description Text (46):

Accordingly, further processing of affected customer data occurs is preferably, but not necessarily, based on the (planned or unplanned) type of travel conditions event determined at 808 as will be discussed in connection with FIGS. 9A and 9B for determining which customers to automatically notify. In either case, if there are further customers which may be affected by the event, the process then loops to A until all customers have been processed to determine if, in fact, their route(s) would be affected.

Detailed Description Text (47):

When all affected customers have been determined, the automatic notification filter as illustrated in detail in FIGS. 9A and 9B is preferably performed only for those travel condition events that are unplanned in nature (e.g. accidents, fires, etc.) as indicated by the branch to C from process 810 in FIG. 8. Determining customers for Automatic Notification, as illustrated in FIGS. 9A and 9B is principally based on the notification criteria in the customer's profile at 911 and the expected duration of the travel condition relative to the customer-specified route notification times at 915, 916 and only these processing steps are essential to the filtering for automatic notification.

Detailed Description Text (48):

The customer is preferably provided the option to deactivate their MTIS service for a specified period of time (e.g. out of town on vacation) and/or the option to deactivate the automatic notification service on a particular route. MTIS verifies that the customer's profile is currently active at 912 and their pre-stored route (s) are also active, as determined at 913, 914 prior to performing the automatic notification filtering process 916. Information about the customers that require automatic notification are noted as such in the affected customer list which is built and stored at 917. It should be appreciated that the testing for active customers and routes minimizes the data which must be processed for each unplanned event, looping through E. The separation of loops through A, C and E (and F of FIG. 10, as will be described below) also allows concurrency or pipelining of processing of the respective loops to improve system response time.

Detailed Description Text (49):

The sub-function, Build Affected Customer List (Area Specific) 704, determines which customers are affected by the reported travel conditions based on the areas defined in their customer profile FIG. 10, as illustrated at 1018. It stores information about which customers are affected by each reported area travel

condition and updates the affected customer list at 1019 when information about an area travel condition is updated. In this regard, it should be noted that information regarding planned events is made available to automatically notified customers upon occurrence of an unplanned event since they will have already been placed on a list of affected customers when advance information concerning a planned event is received by MTIS 100. The information is also made available to automatically notified customers on a call-in basis in advance of the event. In this regard, it is preferred in the interest of both desired functionality and economy to allow access to personalized travel information on a call-in basis for all customers including automatic notification customers as an additional call-in function beyond the functions affecting customer account and profile changes, as will be discussed below in connection with FIG. 12. Therefore, it is preferred to build the affected customer lists 809, 810 at least for unplanned events in response to the occurrence or knowledge of the event, even though determination of a customer affected by a planned event may not be performed until call-in. Automatic notification can also be readily provided by treating a planned event as "unplanned" at 808 of FIG. 8 as of the scheduled time of occurrence. If the event does not occur as planned, of course, the event may be closed (subject to reactivation as an unplanned event at 701, 703 of FIG. 7).

Detailed Description Text (51):

For automatic notification customers, a determination is made when to notify each customer, based on their specified notification time and the current date and time. This function also handles the delivery of the travel conditions message(s) to each affected customer over their specified device. In the preferred embodiment of the invention, the 'Request/Disseminate Personalized Travel Conditions Information function has been partitioned into six sub-functions: Disseminate Personalized Travel Conditions Information via Phone (User on demand request), Manage Auto-Notification, Disseminate Personalized Travel Conditions Information via Phone (Automatic Notification), Disseminate Personalized Travel Conditions Information via Phone (Automatic Notification), Disseminate Personalized Travel Conditions Information via Pager (Automatic Notification), Disseminate Personalized Travel Conditions Information via Facsimile (Automatic Notification), Disseminate Personalized Travel Conditions Information via e-mail (Automatic Notification).

Detailed Description Text (56):

The functions selectable at 1206 include a number of functions to alter or update the customer's personal data profile (which should correspond to the number of types of items provided therein) as well as to transfer the call to a customer representative for special inquiries and services and to end the call. As will be discussed below, travel information can preferably be obtained on a call-in basis in the same manner that any other service related to the customer account can be selected and the caller is preferably prompted to select another service after any selected service has been completed.

Detailed Description Text (61):

If the customer is affected by route conditions, the customer is prompted to specify a previously registered route by a stored voice message which is preferably confirmed. Then, as further shown at 1314, a determination is made if the selected route is affected. It should be noted that this procedure allows a newly registered route to be processed against existing conditions as discussed above in regard to FIG. 9B since registration of a new route will cause that portion of the auto-notification list process to become incomplete even if previously completed for all previously registered routes. That is, after the process is completed for all currently registered routes, it enters a "wait" state depicted by dashed line 919. A new route registration then causes branching at 918 to E to process the new route and re-entry of the wait state.

Detailed Description Text (68):

Manage Auto-Notification, a preferred form of which is illustrated in detail in